



CTGTCACGCCGGGCTCTACGTCCAGGGAGGGAGGGGGCGGCCACACCCAGGCCCGCACCGCTGGGAGTCTGAGGCCTGAGTGAGTGTGTTGGCCGAGGCCTGCATGTCGGGCTGAAGGCT  
GAGTGTCGGGCTGAGGCCTGAGCGAGTGTCCAGCCAAAGGGCTGAGTGTCAGCACACCTGCCGTCTCACTTCCCCACAGGCTGGCGCTCGGCTCCACCCAGGGCCAGCTTTTCCTCAC  
CAGGAGCCCGGCTTCCACTCCCCACATAGGAATAGTCCATCCCCAGATTCCGCCATTGTTACCCCTCGCCCTGCCCTCCTTTGCCCTTCCACCCACCATCCAGGTGGAGACCCTGAGAA  
GGACCCTGGGAGCTCTGGGAATTGGAGTGACCAAAGGTGTGCCCTGTACACAGGCGAGGACCCTGCACCTGGATGGGGGTCCCTGTGGGTCAAATTGGGGGAGGTGCTGTGGGAGTAA  
AATACTGAATATATGAGTTTTTCAGTTTGA

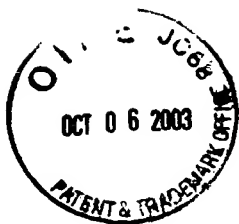
**FIG. 11U**



# N-terminal domain truncated telomerase

ATGCCGCGCGCTCCCGCTGCCGAGCCGTCGCTCCCTGCTGCGCAGCCACTACCGCGAGGTGCTGCCGCTGGCCACGTCGTG  
M P R A P R C R A V R S L L R S H Y R E V L P L A T F V  
CGGGCCTGGGCCCCAGGGCTGGCGGCTGGTGAGCGCGGGACCCGGCGGCTTTCCGCGCGCTGGTGCCCACTGCTGGTGTGCGTGCCCTGGGACGACGGCCGCCCCCGCGC  
R R L G P Q G W R L V Q R G D P A A F R A L V A Q C L V C V P W D A R P P P A A  
CCCCTCCTCCGCGAGGTGCTGCTGAAGGAGCTGGTGGCCGAGTGTGCGAGGCTGTGCGAGCGCGCGCGAAGAACGCTGCTGGCCTTCGGCTTCGCGCTGCTGGACGGGCCCC  
P S F R Q V S C L K E L V A R V L Q R L C E R G A K N V L A F G F A L L D G A R  
CGGGGCCCCCGAGGCTTACCACACGCTGCGCAGCTACCTGCCCAACACGGTGACCGACGCACTGCGGGGAGCGGGGCTGGGGGCTGCTGCTGCGCCGCTGGGCGACGACGT  
G G P P E A F T T S V R S Y L P N T V T D A L R G S G A W G L L L R R V G D D V  
GCTGGTTACCTGCTGGCAGCTGCGCGCTCTTTGTGCTGGTGGCTCCAGCTGCGCTACCAAGTGTGCGGGCGCGCTGTACAGCTGCGCGCTGCCACTCAGGCCCGCCCCCGC  
L V H L L A R C A L F V L V A P S C A G P P L Y Q L G A A T Q A R P P P  
ACAGCTAGTGGACCCGAGCGCTGCGGATGCGAAGCGGCTGGAACCATAGCGTCAGGAGGCGGGGTCCCCCTGGGCTGCGAGCCCGGGTGGAGGAGCGCGGGGCGAGTGC  
H A S G P R R R L G C E R A W N H S V R E A G V P L G L P A P G A R R R R G G S A  
CAGCGAAGTCTGCGCTGCGCAAGAGGCGCAGGCGTGGCGCTGCCCTGAGCGGAGCGGCGGTGGGCGAGGGTCTGGGCCCAACCGGGCAGGACGCGTGGACGAGTGAACG  
S R S L P L P K R P R G A A P E P E R T P V G Q G S W A H P G R T R G P S D R  
TGGTTTCTGTGGTGTACCTGCGCAGACCCCGAAGAACCACTCTTTGGAGGGTGGCTCTCTGGCACGCGCACTCCCAACCATCGTGGGCGCGCAGCACCAGCGGGCCCCC  
G F C V V S P A R P A E E A T S L E G A L S G T R H S H P S V G R Q H H A G P P  
ATCCACATCGCGCCACCACTGCTCCGCGGACGCTTGTCCCCCGGTGTACGCGGAGACCAAGCACTTCTCTACTCTCAGGCGACAAGGAGCAGTGGCGGCTCTCTCTACTCAG  
S T S R P P R P P V D T P C P P V Y A E T K H F L Y S S G D K E Q L R P S F L L S  
CTCTCTGAGGCCAGGCTGACTGGCGCTCGGAGGCTCGTGGAGACCATCTTTCTGGGTTCAGGCGCTGGATGCCAGGACTCCCCGAGGTGCCCCGCTGCCCGAGCTACTGGCA  
S L R P S L T G A R R L V E T I F L G S R P W M P G T P R R L P R L P Q R Y W Q  
AATGCGGCGCTGTTCTGAGAGTGTCTGGGAACACGCGCAGTGGCCCTACGGGGTGTCTCTCAAGACGCACTGCGCGCTGCGAGCTGCGGTACCCCGAGCAGCGGTGTCTGTGCGCG  
M R P L P L E L L G N H A Q C P Y G V L L K T H C P L R A A V T P A A G V C A R  
GGAGAAGCCCGAGGCTCTGTGCGGCCCCGAGGAGGAGGACAGACCCCGCTGCGCTGGTGAGCTGCTCCGCGAGCACAGAGCCCTGGCAGGTGTACGGCTCTGTGCGGGCTG  
E K P Q G S V A A P E E E D T D P R R L V Q L L R Q H S S P W Q V Y G F V R A C  
CTGCGCGCGCTGGTGGCCCGAGGCTCTGGGGCTCCAGGCAACAAGAACCGGCTTCTCAGGAACACCAAGAGTTCATCTCCCTGGGGAAGCATGCCAAGCTCTCGTGCAGGAGCT  
L R R L V P P P G L W G S R H N E R R F L R N T K K F I S L G K H A K L S L Q E L  
GACGTGGAAGATGAGCGTGGGGGACTGCGCTTGGCTGCGCAGGAGCCAGGGGTGGCTGTGTTCGGCGCGCAGAGCACCGTCTGCGTGAGGAGATCTGGCCAAGTTCTGCACTGGCT  
T W K M S V R D C A W L R R S P G V G C V P A A E H R L R E E I L A K F L H W L  
GATGAGTGTGTACGTGCTGAGTGTCTCAGGTCTTTCTTTATGTACGGAGACCACTTTTCAAAAGAACAGGCTCTTTTCTACCGGAAGAGTGTCTGGAGCAAGTTGCAAGCATTGG  
M S V Y V V E L L R S F F Y V T E T T P Q K N R L F F Y R K S V W S K L Q S I G  
AAT - - NNN - - GACAGTCACAGGGGGTTGACCGCGGACTGGGCGTCCCGAGGGTGTACTATAGGACAGGTGTCCAGGTGCCCTGCAAGTAGAGGGGCTCTCAGAGGCGTCTGGCTGG  
CATGGGTGGACGTGGCCCCGGGATGGCTTCTGCGTGTGCTGCCGTGGGTGCCCTGAGCCCTCACTGAGTGGTGGGGCTTGTGGCTTCCCGTGAGCTTCCCCCTAGTCTGTGTCTG  
GCTGAGCAAGCTCTCTGAGGGGCTCTCTATTG-

FIG. 11A



# Truncated protein 1

ATGCCGCGCGCTCCCGCTGCCGAGCCGTGCGCTCCCTGCTGGCGAGCCACTACCGGAGGTGCTGCCGCTGGCCACGTTCTGTG  
M P R A P R C R A V R S L L R S H Y R E V L P L A T P V

CGGCGCCTGGGGCCCGAGGGCTGGCGGCTGGTGCAGCGCGGGGACCCGCGGCTTTCGCGCGCTGGTGGCCAGTGCCTGGTGGCTGCCCTGGGACGCGACGGCCGCGCCCGCGCG  
R R L G P Q G W R L V Q R G D P A A F R A L V A Q C L V C V P W D A R P P P A A

CCCCTCCTTCGCGCAGGTGCTCCTGCCTGAAGGAGCTGGTGGCCGAGTGTGCAGAGGCTGTGCGAGCGCGCGCGAAGAACCTGCTGGCCTTCGCGCTTCGCGCTGTGACGGGGCCCG  
P S F R Q V S C L K E L V A R V L Q R L C E R G A K N V L A F G F A L L D G A R

CGGGGGCCCCCGAGGCTTCAACACGAGCTGCGCAGCTACCTGCCCAACACGGTACCGACGCACTGCGGGGAGCGGGGCTGGGGCTGCTGCTGCCGCGCGTGGCGGCGACGAGCT  
G G P P E A F T T S V R S Y L P N T V T D A L R G S G A W G L L L R R V G D D V

GCTGGTTACCTGCTGGCAGCTGCGCGCTCTTGTGCTGGTGGCTCCGAGTGCCTACCGGTGTGCGGGCCGCGCTGTACAGCTGCGCGCTGCCACTAGGCCCGCGCCCGCGC  
L V H L L A R C A L F V L V A P S C A Y Q V C G P P L Y Q L G A A T Q A R P P P

ACACGCTAGTGGACCCCGAAGCGCTTGGGATGCGAACGGGCTGGAACATAGCGTCAGGAGGCGCGGGTCCCTCGGGCTGCCAGCCCGGGTGGCAGGAGCGCGGGCGAGTGC  
H A S G P R R R L G C E R A W N H S V R E A G V P L G L P A P G A R R R G G S A

CAGCGAAGTCTGCCGTTGCCAAGAGGCGCAGGCTGGCGCTGCCCTGAGCGGAGCGGACCGCGTGGGAGGGGTCTGGGCGCCACCGGGCAGGAGCGCTGGACCGAGTGACCG  
S R S L P L P K R P R R G A A P E P E R T P V G Q G S W A H P G R T R G P S D R

TGGTTTCTGTGTTGTACCTGCGAGACCCCGCAAGAGCCACTCTTGGAGGGTGGCTCTCTGGCAGCGCCACTCCACCCATCCGTGGGCGCGCAGGAGCGCGGGCGCGCGC  
G F C V V S P A R P A E E A T S L E G A L S G T R H S H P S V G R Q H H A G P P

ATCCACATCGCGGCACACGCTCCCTGGGACGCGCTTGTCCCGCGGTGACCGGAGACCAAGCACTTCTCTACTCTCAGGCGACAAGGAGCAGCTGCGGCGCTCTCTCTACTCAG  
S T S R P P R P W D T P C P P V Y A E T K H F L Y S S G D K E Q L R P S F L L S

CTCTGAGGCGCCAGCCTGACTGGCGCTCGGAGGCTCGTGAGACCATCTTCTGGGTTCAGGCGCTGGATGCCAGGACTCCCGCAGGTTGCCCGCTGCCCGAGGCTGCTGTCGCG  
S L R P S L T G A R R L V E T I F L G S R P W M P G T P R R L P R L P Q R Y W Q

AATGCGGCCCTGTCTTCTGAGCTGCTTGGGAACACGCGCAGTGCCTTACGGGGTGTCTCTCAAGACGCACTGCCCGTGGAGCTGCGGTACCCCGAGCAGCGGCTGTCTGTGCGCG  
M R P L F L E L L G N H A Q C P Y G V L L K T H C P L R A A V T P A A G V C A R

GGAGAAGCCCGAGGCTCTGTGGCGGCGCCCGAGGAGGAGACACAGACCCCGCTGCGCTGGTGCAGTGTCTCCCGCAGCACAGCAGCCCTGGCAGGTGTACGGCTTCTGTGCGGCGCTG  
E K P Q G S V A A P E E E D T D P R R L V Q L L R Q H S S P W Q V Y G F V R A C

CCTGCGCGCGCTGGTGGCGGCGCTGCGGCTCCAGGACACAGAACGCGCTTCTCAGGAACACCAAGAGTTCTATCTCCCTGGGAAGCATGCCAAGCTCTGCTGCAGGAGCT  
L R R L V P P G L W G S R H N E R R F L R N T K K F I S L G K H A K L S L Q E L

GACGTGGAAGATGAGCGTGGGACTGCGCTTGGCTGCGCAGGAGCCCGGGTGGCTGTGTTCCGGCCGAGAGCAGCGTCTGCGTGAGGAGATCTGGCCAAGTTCTGCACTGGCT  
T W K M S V R D C A W L R R S P G V G C V P A A E H R L R E E I L A K F L H W L

GATGAGTGTACGTCGTCGAGCTGCTCAGGTCTTTCTTTATGTACGGAGACACGTTTCAAAGAACAGGCTCTTTTCTACCGGAAGAGTGTCTGGAGCAAGTTGCAAAGCATTTGG  
M S V Y V V E L L R S F F Y V T E T T F Q K N R L F F Y R K S V W S K L Q S I G

AATCAGACAGCACTTGAAGAGGGTGCAGCTGCGGGAGCTGTGGAAGCAGAGGTGAGGAGCATCGGAAGCCAGGCGCGCTGCTGACGTCAGACTCCGCTTATCCCCAAGCCTGA  
I R Q H L K R V Q L R E L S E A E V R Q H R E A R P A L L T S R L R P I P K P D

GTGGCTGTGCTTGGTTTAACTTCCTTTTAAACCAGAA  
V A V L W F T F L F N Q K

CGGGCTGCGGCGGATTGTGAACATGGACTACGTCGTGGGAGCCAGAACGTTCCGAGAGAAAAGAGGCGGAGCGTCTCACCTCGAGGGTGAAGGCACTGTTACGCGTCTCAACTACGA  
G L R P I V N M D Y V V G A R T F R R E K R P S V S F R G \*

FIG. 11B



## Truncated protein 2

ATGCGCGCGCTCCCGCTGCCGAGCCGCTGCGCTCCCTGCTGCGCAGCCACTACCGGAGGTGCTGCCGTGGCCACGTTCTGTG  
M P R A P R C R A V R S L L R S H Y R E V L P L A T F V

CGGCGCTGGGGCCCGAGGCTGGCGGCTGGTGCAGCGCGGGGACCGGGCGGCTTTCGCGCGCTGGTGGCCAGTGCCTGGTGTGCGTGCCTGGGACGCGACGGCCCGCCCGCGCG  
R R L G P Q G W R L V Q R G D P A A F R A L V A Q C L V C V P W D A R P P P A A

CCCTCCTTCGCGCAGGTGCTCTGCTGAAGGAGCTGGTGGCCGAGTGCCTGCAGAGGCTGTGCGAGCGCGCGCGAAGAACGTCGCTGGCCTTCGCGCTTCGCGCTGCTGCGAGCGGGCCCG  
P S F R Q V S C L K E L V A R V L Q R L C E R G A K N V L A F G F A L L D G A R

CGGGGGCCCCCGAGGCTTACCCAGCGTGCAGCTACCTGCCCAACAGGTGACGCGCACTGCGGGGAGCGGGCGTGGGGCTGCTGCTGCGCGCGCTGGGCGACGACGT  
G G P P E A F T T S V R S Y L P N T V T D A L R G S G A W G L L L R R V G D D V

GCTGGTTCACCTGCTGGCAGCTGCGCGCTCTTGTGTGCTGGTCCAGCTGCGCCTACAGGTGTGCGGGCGCGCTGTACAGCTCGCGCTGCCACTCAGGCCCGCGCCCGCC  
L V H L L A R C A L F V L V A P S C A Y Q V C G P P L Y Q L G A A T Q A R P P P

ACAGCTAGTGGACCCGAGGCGTGGGATGCGAACGGGCTGGAACATAGCGTCAGGGAGGCGGGGTCCCTTGGGCTGCCAGCCCGGGTGCAGAGGCGCGGGGCGAGTGC  
H A S G P R R R L G C E R A W N H S V R E A G V P L G L P A P G A R R R G G S A

CAGCGAAGTCTGCGCTTGCCTAAGAGGCGCAGGCGTGGCGCTGCCCTGAGCCGAGCGAGCGCGCTTGGGCGAGGCTCTGGGCGCACCGCGCGAGTGGACCGGAGTGC  
S R S L P L P R P R R L P R V L C A P P E R T P V G Q G S W A H P G R T R G P S D R

TGGTTCTGTGTGTGTACCTGCCAGACCCCGAAGACCACTCTTGGAGGCTGCGCTCTTGCAGCGCGCACTCCACCCATCCGTGGGCGCGAGCACCGCGGGCCCCC  
G F C V V S P A R P A E E A T S L E G A L S G T R H S H P S V G R Q H H A G P P

ATCCACATCGCGCCACCACTGCTGGGACACGCTTGTCCCCGGTGTACGCGAGACCAAGCACTTCTCTACTCTCAGGCGACAAGGAGCAGCTGCGCGCTCTCTCTACTCAG  
S L R P S L T G A R R L V E T I F L G S R P W M P G T P R R L P R L P Q R Y V Q

CTCTGAGGCGCGCTGCTGCTGCGCTGCGAGGCTGCTGGAGACCTCTTCTGGGTTCAGGCGCTGGATGCCAGGACTCCCGCGAGTTCGCCCGCTGCCCGAGGCTACTGGCA  
S L R P S L T G A R R L V E T I F L G S R P W M P G T P R R L P R L P Q R Y V Q

AATCGGCGCTGTTCTTGGAGCTGCTTGGGAACACGCGCAGTGCCTTACGGGGTGTCTCTAAGACGCACTGCCCGCTGCGAGCTGCGCGCTGCGCGCTGCTGCGCG  
M R P L F L E L L G N H A C P Y Y A E T K H F L Y S S G D K E Q L R P S F L L S

GGAGAAGCCCGAGGCTCTGTGCGCGCCCGAGGAGGAGACACAGACCCCGTGCCTGGTGCAGCTGCTCCCGCAGCACAGCAGCCCTGGCAGGTGTACGGCTCTGTGCGGCGCT  
E K P Q G S V A A P E E E D T D P R R L V Q L L R Q H S S P W Q V Y G F V R A C

CCTGCGCGCGCTGCTGCTGCGCGCTGCGGGTCCAGGCGACAAGCAAGCCGCTTCTCAGGAGACACGCTTCAAAAGAGTTCATCTCCCTGGGGAAGCATGCCAAGCTCTGCTGCAGGAGCT  
L R R L P P P G L W G S R H N E R R F L R N T K K F I S L G K H A K L S L Q E L

GACGTGGAAGATGAGCGTGGCGGACTGCGCTTGGCTGCGCAGGAGCCAGGGTGGCTGTGTTCGCGCGCAGAGCACCGTCTGCGTGAGGAGATCCTGGCCAAGTTCCTGCACCTGGCT  
T W K M S V R D C A W L R R S P G V G C V P A A E H R L R E E I L A K F L H W L

GATGAGTGTGTACGTGCTGAGCTGCTCAGGTCTTCTTTATGTACCGGAGACACGCTTCAAAAGAGTTCATCTCCCTGGGGAAGAGTGTCTGGAGCAAGTTGCAAAGCATTGG  
M S V Y V V E L L R S F F Y V T E T T F Q K N R L F F Y R K S V W S K L Q S I G

AATCAGACGCACTTGAAGAGGCTGAGCTGCGGAGCTGTGGAAGCAGAGGTGAGGAGCATCGGGAAGCCAGGCGCGCTGCTGACGTCCAGACTCCGCTTCATCCCAAGCCTGA  
I R Q H L K R V Q L R E L S E A E V R Q H R E A R P A L L T S R L R F I P K P D

CGGGCTGCGCGGATTGTGAACATGGAATACGTGCTGGGAGCCAGAACGTTCCGCGAGAGAAAGGGCGGAGCGTCTCACCTCGAGGGTGAAGGCACTGTTCAGCGTGTCAACTACGA  
G L R P I V N M D Y V V G A R T F R R E K R A E R L T S R V K A L F S V L N Y E

GCGGGCGCGCGCGCGCTCTGCTGGGCGCTCTGTGCTGGGCTGGACGATATCCACAGGCGCTGCGCGACCTTGTGCTGCGTGTGCGGGCCAGGACCCCGCGCTGAGCTGTACTT  
R A R R P G L L G A S V L G L D D I H R A W R T F V L R V R A Q D P P P E L Y F

TGTCAAGTGTGATGACGGGCGCGTACGACCATCCCCAGGACAGGCTCAGGAGGTATCGCGAGCATCATCAAAACCCAGAACAGTACTGCTGCGTGGTATGCGGTGTTCCCA  
V K V D V T G A Y D T I P Q D R L T E V I A S I I K P Q N T Y C V R R Y A V V Q

GAAGGCGCGCATGGGACGCTCCGCAAGGCTTCAAGAGCCAC  
K A A H G H V R K A F K S H

GTCCTACGTCAGTG  
V L R P V

CCAGGGGATCCCGAGGCTCCATCTCTCCAGCTGCTCTGCAGCTGTGCTACGGCGACATGAGAGCAAGCTGTTTGGGGGATTCCGGCGGACCGGGCTGCTCCTGCTTGGTGA  
P G D P A G L H P L H A A L Q P V L R R H G E Q A V C G D S A G R A A P A F G G

TGATTTCTTGTGGTGACACCTCACCTCACCCAGCGAAAACCTTCTCAGGACCTGGTCCGAGGTGTCCTGAGTATGGCTGCGTGGTGAACCTTGGCGAAGACAGTGGTGAACCTTCC

FIG. 11C



# Truncated protein 3

ATGCCGCGCGCTCCCGCTGCCGAGCCGTCGCTCCCTGCTGCGCAGCCACTACCGCGAGGTGCTGCCGCTGCCACGTTGCTG  
M P R A P R C R A V R S L L R S H Y R E V L P L A T F V  
CGCGCCTGGGGCCCCAGGGCTGGCGGCTGGTGCAGCGCGGGGACCGGGCGCTTCCGCGCGCTGGTGGCCAGTGCTGGTGGTGGCTGGGAGCGACGGCCCGCCCCCGCCG  
R R L G P Q G W R L V Q R G D P A A F R A L V A Q C L V C V P W D A R P P P A A  
CCCCCTCTTCGCGCAGGTGCTGCTGCTGAAGGAGCTGGTGGCCGAGTGTGTCGAGAGGCTGTGCGAGCGCGCGCGAAGAACGTGCTGGCCTTCGGCTTCGCGCTGCTGGAAGGGGCCG  
P S F R Q V S C L K E L V A R V L Q R L C E R G A K N V L A F G F A L L D G A R  
CGGGGGCCCCCGAGGCTTACCAACAGCGTGCAGCTACCTGCCCAACACGGTGACCGACGCACTGCGGGGAGCGGGGCGTGGGGGCTGCTGCTGCGCGCGCTGGGCGACGAGT  
G G P P E A F T T S V R S Y L P N T V T D A L R G S G A W G L L L R R V G D D V  
GCTGGTTCACTGCTGGCAGCTGCCGCTCTTGTGCTGGTGGCTCCAGCTGCGCTTACAGGTGTGCGGGCGCGCTGTACCACTGCGCGCTGCGCACTAGGCCCCGGCCCCCGCC  
L V H L L A R C A L F V L V A P S C A Y Q V C G P P L Y Q L G A A T Q A R P P P  
ACACGCTAGTGGACCCGAAGCGTCTGGGATGCGAACGGGCTGGAACATAGCTGAGGAGGCGGGGTCCCTGCGGCTGCCAGCCCCGGGTGCGAGGAGGCGGGGGCAGTGC  
H A S G P R R R L G C E R A W N H S V R E A G V P L G L P A P G A R R R R G G S A  
CAGCGAAGTCTGCGCTTGCCTAAGAGGCGCAGCGTGGCGCTGCCCTGAGCGGAGCGGACGCCGTTGGGCGAGGGTCTGGGCGCACCGGGGAGGACGCGTGAACCGAGTGACCG  
S T S R P P R P R K P R R G A A P V Y A E T K H F L Y S S G D K E A A T Q A R P P P  
TGTTTCTGTGTGGTGTCACTGCGAGACCGCGAAGAACCTCTTGGAGGGTGGCTCTCTGCGACGCGCACTCCCACTCCCTGCGGCGCGAGCAGCAGCGGGCCCCC  
G F C V V S P A R P A E E A T S L E G A L S G T R H S H P S V G R Q H H A G P P  
ATCCACATCGCGCCACACGCTCCCTGGGACACGCTTGTCCCCGGTGTACCGGAGACCAAGCACTTCTCTACTCTCAGGCGACAAGGAGCAGTGGCGCCCTCTCTACTCAG  
S T S R P P R P R K P P P V Y A E T K H F L Y S S G D K E A A T Q A R P P P  
CTCTGAGGCGCAGCTGCTGCGCTCGGAGGCTGCTGGAGCACTCTTCTGGGTTCCAGGCGCTGGATGCCAGGAGTCCCCGCGAGTTGCCCGCGCTCCCCAGGCGTACTGGCA  
S L R P S L T G A R R L V E T I F L G S R P W M P G T P R R L P R L P Q R Y W Q  
AATCGGCCCCCTGTTCTGAGCTGCTGGGAACACGCGCAGTGCCTTACGGGGTGTCTCTCAAGACGCACTGCCCGCTGCGAGCTGGGTCACCCAGCAGCGGCTGTGTGCCCC  
M R P L F L E L L G N H A Q C P Y G V L L R H T C P L R A A V T P A G V L C A R  
GGAGAGCCCCAGGCGCTGTGGCGGCGCCCGAGGAGGAGACAGAGCCCCCTGCGCTGGTGCAGTGTCTCCGCGCAGCAGCAGCGCCCTGGCAGGTGTACGGCTTGTGGCGGCGCTG  
E K P Q G S V A A P E E E D T D P R R L V Q L L R Q H S S P W Q V Y G F V R A C  
CCTGCGCGGCTGTGCTGCCCGCAGGCTCTGGGGCTCCAGGCAACAGCGCGCTTCTCAGGAACACCAAGAGTTCATCTCCCTGGGGAAGCATGCCAAGCTCTCGTGCAGGAGT  
L R L V P P L W G S R H N E R R F L R N T K K F I S L G K H A K L S L Q S I G  
GACGTGGAAGATGAGCTGCGGACTGCGCTTGGCTCGCGAGGAGCCAGGGGTGGCTGTGTTCCGCGCGCAGAGCACCGTCTGCGTGAGGAGATCTGCCAAGTTCCTGCACTGGCT  
T W K M S V R D C A W L R R S P G V G C V P A A E H R L R E E I L A K F L H W L  
GATGAGTGTGTACGTGCTGAGCTGCTCAGGTCTTCTTTATGTACGAGGACCACTGTTCAAAGAACAGGCTCTTTTCTACCGGAAGAGTGTGAGGAGCAAGTGAAGCAATTGG  
M S V Y V P L L R S F F Y V T E T T F R R E K R A E R L T S R A V K A L P F S V L N Y E  
AATCAGCAGCACTTGAAGAGGTGACGCTGCGGAGCTGTGGAAGCAGAGGTGAGGAGCATCGGAAGCCAGGCGCCCTGCTGAGCTCCAGACTCGCTTCATCCCCAAGCTGA  
I R Q H L K R V Q L R E L S E A E V R Q H R E A R P A L L T S R L R F I P K P D  
CGGGCTGCGCGATTGTGAACATGGAACGCTGCTGGGAGCGAGAACGTTCCGAGAGAAAGAGGGCGAGCGTCTCAGCTGAGGGTGAAGGCACTGTTGAGCGTGTCAACTACGA  
G L R P I V N M D Y V V G A R T F R R E K R A E R L T S R A V K A L P F S V L N Y E  
GGGGCGCGGCGCCCGGCTCTGCGGCGCTCTGTGCTGGGCGCTGACGATATCCAGAGGCGTGGCGCACCTTCGTGCTGCGTGTGCGGGCCAGGACCCGCGCGCTGAGCTGTACTT  
R A R R P G L L G A S V L G L D D I H R A W R T F V L R V R A Q D P P P E L Y F  
TGTCAAGGTGGATGTGACGGGCGGTACGACACCATCCCCAGGACAGGCTCAGGAGGTTCATCGCCAGCATCATCAAAACCCAGAACAGTACTGCGTGGCTCGGTATGCCGTGGTCCA  
V K V D V T G A Y D T I P Q D R L R F L T E V I A S I I K P Q N T Y C V R R Y A V V Q  
GAAGGCGCCCATGGGCACTCCGCAAGGCTTCAAGAGCCAGCTCTACCTTGACAGACCTCCAGCGGTACATGCGACAGTTGCTGGCTCACCTGCAGGAGACAGCGCGCTGAGGGA  
K A A H G H V R K A F K S H V S T L T D L Q P Y M R Q P V A H L Q E T S P L R D  
TGCGTGTGTCATGAGCAGAGCTCTCCCTGAATGAGGCCAGCAGTGGCTCTTTCGAGCTTCTCTACGCTTCATGTGCCACACCGCGTGCATCAGGGGCAAGTCTACGTCCAGTG  
A V V I E Q S S S L N E A S S G L F D V F L R F M C H H A V R I R G K S Y V Q C  
CCAGGGGATCCGCGAGGCTCCATCTCTCCAGCTGCTCTGCGAGCTGTGCTACGGGACATGGAGAACAGCTGTTTGGGGGATTGGCGGGACGGGCTGCTCCTGCGTTTGGTGA  
Q G I P Q G S I L S T L L C S L C Y G D M E N K L F A G I R R D G L L L R L V D  
TGATTTCTGTGTGACCTCACCTCACCCACGCGAAACCTTCTCAGGACCTGGTCCGAGGTGTCCCTGAGTATGGCTGCGTGGTGAACCTTGCAGAACAGTGGTGAACCTTCCC  
D F L L V T P H L T H A K T F L R T L V R G V P E Y G C V V N L R K T V V N F P  
TGTAAGACAGGCGCTGGGTGGCAGGCTTTTGTTCAGATCGCGGCCACGGCTATTCCCTGGTGGCGGCTGCTGCTGGATACCGGACCCGAGGAGTGCAGAGCGACTACTCCAG  
V E D E A L G G T A F V Q M P A H G L F P W C G L L L D T R T L E V Q S D Y S R  
GTGAGCGCACCTGGCGGAAAGTGGAGCTGTGCCCGGCTGGGCGAGGTGTGCTGCGAGGCGGTGCTGCCACTCTGCTTCCGTGTTGGGGCAGGCGACTGCCAATCCCAAGGGTCAGA  
TGCCACAGGGTGGCCCTCGTCCCATCTGGGCTGAGCACAAATGCATCTTCTGTGGGAGTGAAGGTGCCTCAACGGGAGCAGTTTCTGTGCTATTTTGGTAA...

FIG. 11G

Altered C-terminus protein



Truncated protein that lacks motif A







# N-terminal domain truncated telomerase (ver. 2)

ATGCCGCGCGCTCCCCGCTGCCGAGCGTGCCTCCCTGCTGCGCAGCCACTACCGGAGGTGCTGCCGCTGGCCACGTTCTGTG  
M P R A P R C R A V R S L L R S H Y R E V L P L A T P V  
CGGCGCTGGGCCCCAGGGCTGGCGGCTGGTGACGCGCGGGACCCGGCGGCTTTCCGCGCGCTGGTGGCCAGTGCCTGGTGTGCTGCCCTGGGACGACGCGCGCGCCCCCGCGCG  
R R L G P Q G W R L V Q R G D P A A F R A L V A Q C L V C V P W D A R P P P A A  
GGCCTCCCGGGGTCCGCGTCCGGCTGGGGTTGAGGCGCGCGGGGGGAACAGCGACATGCGGAGAGCAGCGCAGGCGACTCAGGGCGCTTCCCGCGAGTG  
G L P G V G V R L G L R A A G G N Q R H A E S S A G D S G R F P R R  
A S P G S A S G W G \* G R P G G T S D M R R A A Q A T Q G A S P A G  
P P R G R R P A G V E G G R G E P A T C G E Q R R R L R A L P P Q V  
CCCCCTCTCCCGCAGGTGCTCCTGCTGAAGGAGCTGGTGGCCGAGTGTGTCAGAGGCTGTGCGAGCGCGGCGGAAGAGCTGCTGGCTTCCGCTTCCGCTGCTGGACGGGCGCG  
P S F R Q V S C L K E L V A R V L Q R L C E R G A K N V L A F G F A L L D G A R  
CGGGGCCCCCGGAGGCTTACCACAGCGTGCAGCTACCTGCCCAACCGGTGACCGACGCACTGCGGGGAGCGGGCGTGGGGGCTGCTGCTGCCCGCGTGGCGGACGAGT  
G G P P E A F T T S V R S Y L P N T V T D A L R G S G A W G L L L R R V G D D V  
GCTGGTTCACTGCTGGCAGCTGCGCGCTCTTGTGCTGGTGGCTCCAGCTGCGCCTACCGAGTGTGCGGGCGCGCTGTACAGCTCGGCGCTGCCACTCAGGCCCGCGCGCGCG  
L V H L L A R C A L F V L V A P S C A Y Q V C G P P L Y Q L G A A T Q A R P P P  
ACAGCTAGTGGACCCGAAGCGCTTGGGATGCGAACCGGCTGGAACTAGCGTCAAGGAGCGCGGGTCCCGCTGGGCTGCCAGCCCGGGTGGGAGGAGCGCGGGGCGAGTGC  
H A S G P R R R L G C E R A W N H S L V R E A G V P L G L P A P G A R R R G G S A  
CAGCGAAGTCTGCGGTGCGCAAGAGGCGCGCGTGGCGCTGCCCTGAGCCGAGCGGACGCGCGTGGGCGAGGGTCTGGGCGCCACCGGGCAGGACGCTGGACCGAGTGACCG  
S R S L P L P K R P R R G A A P E P E R T P V G Q G S W A H P G R T R G F S D R  
TGGTTCTGTGGTGTCACTGCGACCGCGCGCAAGAACCCACTCTTTGGAGGTGCGCTCTTGGCAGCGCCACTTCCACCCATCCGTGGGCGCGCAGCACCGCGCGCGCGCG  
G F C V V S P A R P A E E A T S L E G A L S G T R H S H P S V G R Q H H A G P P  
ATCCACATCGCGGCCACCACTGCTCCCTGGGACACGCTTGTCCCCCGGTGTACCGGAGACCAAGCACTTCTCTACTCTCTCAGGCGACAAGGAGCAGTGTGGGCGCTCTCTCTACTCAG  
S T S R P P R P W D T P C P P V Y A E T K H F L Y S S G D K E Q L R P S F L L S  
CTCTCTGAGGCCAGCCTGACTGGCGCTCGGAGGCTCGTGGAGACCATCTTTCTGGGTTCAGGCGCTGATGCCAGGACTCCCCGAGGTGCCCCGCTGCCCGAGCGCTACTGGCA  
S L R P S L T G A R R L V E T I P L G S R P W M P G T P R R L P R L P Q R Y W Q  
AATGCGGCCCTGTTCTGGAGCTGCTTGGGAACACGCGCAGTGCCTTACGGGGTGTCTCTCAAGACGCACTGCCCGCTGCGAGCTGCGGTACCCCGAGCAGCGGTGTGTGCGCG  
M R P L P L E L L G N H A Q C P Y G V L L K T H C P L R A A V T P A A G V C A R  
GGAGAAGCCCCAGGGCTCTGTGGCGGCCCCGAGGAGGAGACACAGACCCCGTCCGCTGGTGCAGTGTCTCCGCGACACAGCAGCGCTGGCAGGTGTACGGCTTCTGTGCGGCGCTG  
E K P Q G S V A A P E E E D T D P R R L V Q L L R Q H S S P W Q V Y G F V R A C  
CCTGCGCGGCTGGTGCCCGCAGGCTCTGGGGCTCCAGGCACAACGAACGCGCTTCTCAGGAACACCAAGAAGTTCTCTCCCTGGGAAGCATGCCAAGCTCTGCTGCGAGGAGT  
L R R L V P P G L W G S R H N E R R F L R N T K K F I S L G K H A K L S L Q E L  
GACGTGAAGATGAGCGTGGGACTGCGCTTGGCTGCGCAGGAGCCAGGGGTGGCTGTGTTCCGGCGCAGAGCACCGTCTGCGTGAGGAGATCTCGGCAAGTTCTGCACTGGCT  
T W K M S V R D C A W L R R S P G V G C V P A A E H R L R E E I L A K F L H W L  
GATGAGTGTACGTGCTGAGCTGCTCAGGTCTTTCTTTATGTACGAGACACGTTTCAAAAGAACAGGCTCTTTTCTACCGGAAGAGTGTCTGGAGCAAGTTGCAAGCATTTGG  
M S V Y V V E L L R S P F Y V T E T T F Q K N R L F F Y R K S V W S K L Q S I G  
AAT--NNN--GACAGTACCAGGGGGTTGACCGCGGACTGGGCGTCCCCAGGGTTGACTATAGGACAGGTGTCCAGGTGCCCTGCAAGTAGAGGGGCTCTCAGAGCGCTGGCTGG  
CATGGGTGACGTGGCCCCGGGCATGGCCTTCTGCGTGTGCTGCCGTGGGTGCCCTGAGCCCTCACTGAGTCGGTGGGGCTTGTGGCTTCCCGTGAGCTTCCCCCTAGTCTGTTGTCTG  
GCTGAGCAAGCCTCTGAGGGCTCTCTATTG...

FIG. 11L

Truncated protein 1 (ver. 2)







# Altered C-terminus protein (ver. 2)

ATGCCGCGCGCTCCCGCTGCCGAGCGCTGCGCTCCCTGCTGCGCAGCCACTACCGCGAGGTGCTGCCGCTGCCAGCTTCGCTG  
M P R A P R C R A V R S L L R S H Y R E V L P L A T F V  
CGGCGCTGGGCCCCAGGCTGGCGGCTGGTGCAGCGCGGGGACCGCGCGCTTTCCGCGCGCTGGTGGCCAGTGCCTGGTGTGCTGCCCTGGGAGCGACCGCGCCCCCGCGCG  
R R L G P Q G W R L V Q R G D P A A F R A L V A Q C L V C V P W D A R P P P A A  
GGCCTCCCGGGGTCCGCGCTCCGCGTGGGGTTGAGGCGCGCGGGGGAACAGCGACATGCGGAGAGCAGCGCAGGCTCAGGGCGCTTCCCGCGAGGTG  
G L P G V G V R L G L R A A G G N Q R H A E S S A G A D S G R F P R R  
A S P G S A S G W G \* G R P G G T S D M R R A A Q A T Q G A S P A G  
P P R G R R P A G V E G G R G E P A T C G E Q R R R L R A L P P Q V  
CCCTCTCTCCCGCAGGTCTCCTGCTGAAGAGCTGGTGGCCGAGTGTGCGAGAGCGCGCGGAAGAGCTGCTGCCCTTCGCTTCGCGCTGCTGGAGCGGCCCCG  
P S F R Q V S C L K E L V A R V L Q R L C E R G A K N V L A F G F A L L D G A R  
CGGGGCCCCCGAGGCTTCACACCAGCGTGCAGCTACCTGCCCAACAGTGCAGCGACCTGCGGGGAGCGGGGCGTGGGGCTGCTGCTGCCGCGCGTGGAGCGGCGCG  
G G P P E A F T S V R S Y L P N T V T D A L R G S G A W G L L L R R V G D D V  
GCTGGTTCACCTGCTGCAGCTGCGCGCTCTTGTGCTGGTGGCTCCAGCTGCGCTACCGAGTGTGCGGGCGCGCTGTACAGCTGCGCGCTGCCACTCAGGCGCGCGCGCGCG  
L V H L L A R C A L F V L V A P S C A Y Q V C G P P L Y Q L G A A T Q A R P P P  
ACAGCTAGTGGACCGGAGCGCTGGAGTGCAGACGGGCTGGAACATAGCGTACGGAGCGCGGGTCCCTTCGGGCTGCCAGCGCGGGTGCAGGAGCGCGCGCGCGCG  
H A S G P R R R L G C E R A W N H S G A G V P L G L P A P G A R R R G G S A  
CAGCGAAGTCTGCGCTGCCAAGAGGCGCGAGGCTGGCGCTGCCCTGAGCGGAGCGGAGCGCGCTGGGCGAGGGTCTGGGCGCACCGCGGAGCGCGCTGGAGCGAGTACCG  
S R S L P L P K R P R R G A A P E P E R T P V G Q G S W A H P G R T R G P S D R  
TGGTTCCTGCTGGTGTACCTGCCAGACCGCGCGAAGAGCCACTCTTGGAGGCTGGCTCTTGGCAGCGCGCACTCCACCCACTCCCTGGCGCGCGCGCGCGCGCGCGCG  
ATCCACATCGCGGCGCACGCTCCCTGGGACAGCGCTTGTCCCGGCTGACCGGAGCGAGCACTTCTCTACTCTCAGCGAGAGGAGCAGCTGCGCGCTCTCTCTACTCAG  
S T S R P P R P W D T P C P P V Y A E T K H F L Y S S G D K E Q L R P S L S  
CTCTGAGGCGCGCGCTGACTGGCGCTCGGAGGCTCGTGGAGACCATCTTTCGGGTTCAGGCGCGTGGAGCGCGGAGTCCCGCGCTGCCCGCGCGCTGCGCGCGCGCGCG  
S L R P S L R P L V E T I F L G S R P W M P G T P R R L P R L P Q R Y W Q  
AATGCGCGCGCTGTTCTGAGCTGCTTGGGAACACGCGAGTGCCTTACGGGGTGTCTCTCAAGAGCGACTGCCCGCTGCGAGCTGCGGTACCCCGAGCAGCGGTGTCTGCGCGG  
M R P L F L E L L G N H A Q C P Y G V L L K T H C P L R A A V T P A A G V C A R  
GGAGAGCGCGCGCTGCTGGCGCGCGCGGAGGAGGACAGACCGCGCTGCGCTGGTGGCAGCTGCTCCCGCAGCAGCAGCGCGCTGCGCGCTGCGCGCTGCGCGCGCGCGCG  
E K P Q V S L A A P E E E D T D P R L Q L L R Q H S S P W Q V Y G F V R A C  
CCTGCGCGCGCTGCTGCCCGCGCGCTCGGGGCTCCAGGACAGCAAGCGCGCTTCTCAGGAACACCAAGAGTTCATCTCCCTGGGAGAGTGCAGAGCTCTCGCTGCGAGGAGT  
L R R L V P P P G L W G S R H N E R R F L R N T K K F I S L G K H A K L S L G E L  
GACGTGGAAGATGAGCGTGGCGGACTCGCGCTGGCTGCGCAGGAGCGCGGGTGGCTGTGTCGCGCGCAGAGCACCGCTGCGTGAGAGATCCTGCCAAGTTCCTGCACTGGCT  
T W K M S V R D C A W L R S P G V G C V P P A A E H R L R E E I L A K F L H W L  
GATGAGTGTGACGTGCTGAGCTGCTCAGGTCTTTCTTTATGTACGAGAGACCGTTCCTCAAGAGAGAGGCTCTTTTACCGGAGAGTGTCTGGAGCAAGTGCAGAGCATTGG  
M S V Y V V E L L R S F F Y V T E T T F Q K N R L P F F Y R K S V F Y R K S V L Q S I G  
AATCAGACAGCACTGAAGAGGTGACGTGCGGGAGCTGCGAAGCAGAGTGCAGGACAGCTGCGGAGCGCGCTGCTGACGTGCGAGTCCGCTTCATCCCAAGCGCTGA  
I R Q H L K R V Q L R E L S E A E V R Q H R E A R P A L L T S R L R F I P K P D  
CGGGCTGCGGCGGATTGTGAACATGAGTACGTGCTGGGAGCGCAGACGTTCGCGAGAGAAAGAGGCGCGAGCGTCTACCTCGAGGGTGAAGGCACTGTTCAGCGTGTCTCAACTACGA  
G L R P I V N M D Y V V G A R T F R R E K R A E R L T S R V K A L F S V L N Y E  
GCGGGCGCGCGCGCGCGCTCTCGGGCGCTCTGTGCTGGGCTGAGCAGTATCCAGGCGCTGCGGACCTTCTGCTGCTGCTGCGGGCGCGGAGCGCGCGCTGAGCTGTACTT  
R A R R P S V L G L G A S V L G D D I H R A W R T F V L R V R A Q D P P P E L Y F  
TGTCAAGTGGATGTGACGCGCGGTACGACACCATCCCGCAGGACAGGCTCAGCGAGTTCATGCGAGCATCAAAACCCAGAACAGTACTCGCTGCGTGGTATGCGGTGGTCCA  
V K V D V T G A Y D T I P Q D R L T E V I A S I I K P Q N T Y C V R R Y A V V Q C  
GAAGGCGCGCGCGCGCGCTTCAGAGCGCGCTCTACCTTGACAGACCTCCAGCGTACATGCGACAGTTCGTGGCTCACCTGCGAGGAGACGCGCGCTGAGGGA  
K A A H G H V R K A F K S H V S T L T D L Q P Y M R Q F V A H L Q E T S P L R D  
TGCGCTGCTCATGAGCAGAGCTCTCCCTGAATGAGGCGCAGTGGCGCTCTTCGAGCTCTTCTACGCTTCATGTGCCACCGCGCTGCGCATCAGGGGCAAGTCTACGTCCAGTG  
A V V I E Q S S S L N E A S S G L F D V F L R F M C H H A V R I R G K S Y V Q C  
CCAGGGGATCCCGCAGGCGCTCATCTCTCCAGCTGCTGCGAGCTGTGCTACGGCGACATGGAGAACAGCTGTTTGGGGGATTGCGGGGAGCGGGCTGCTCTCGCTTGGTGGGA  
Q G I P Q G S I L S T L L C S L C Y G D M E N K L F A G I R R D G L L L R L V D  
TGATTCTTGTGGTACACCTCACTCAGCCAGCGGAAACCTTCTCAGGACCTGGTCCGAGGTGTCCTGAGTATGCTGCTGCTGGAACCTGCGGAAGACAGTGGTGAACCTCCC  
D F L L V T P H L T H A K T F L R T L V R G V P E Y G C V V N L R K T V V N F P  
TGTAGAAGACGAGGCGCTGGTGGCAGCTTTGTTCAGATGCGGCGCGCGCTATTTCCCTGGTGGCGCTGCTGCTGATACCCGGACCTGGAGGTGAGAGCGGACTACTCCAG  
V E D E A L G G T A F V Q M P A H G L F P W C G L L L D T R T L E V Q S D Y S S  
CTATGCGCGGACCTCCATCAGAGCAGTCTCACCTTCAACCGCGGCTTCAAGGCTGGGAGGAACATGCGTCGCAAACTCTTTGGGGTCTTGGCGCTGAAGTGTACAGCGCTGTCTCTGGA  
Y A R T S I R A S L T F N R G F K A G R N M R R K L F G V L R L K C H S L F L D  
TTTGCAGGTGAACAGCGCTCCAGCGGTGTGACCAACATCTACAAGATCTCTCTGCTGCGAGCGTACAGGTTTCAAGCATGTGTGCTGCGAGCTCCCATTTATCAGCAAGTTTGAAGAA  
L Q V N S L Q T V C T N I Y K I L L L Q A Y R F H A C V L Q L P F H Q Q V W K N  
CCCCACATTTTCTGCGGCTCATCTGTACAGCGCTCTCTGCTACTCCATCTGAAAGCAAGAACGCGAGGATGTGCTGGGGGCAAGGCGCGCGCGCGCTCTGCGCTCCGA  
P T F F L R V I S D T A S L C Y S I L K A K N A E  
CCGAAGAAAACATTTCTGCTGACTCTGCGGTGCTTGGGT  
E E N I L V V T P A V L G S  
GGGACAGCGAGATGAGAGCAACCGCGAGCGTGGGTGTGGGAGCTTTCCGGTGTCTCCTGGGAGGGAGTGGGCTGGGCGCTGACTCTCAGCTCTGTTTTCCCGAG  
G Q P E M E P P R R P S G V G S F P V S P G R G V G L G L \*

FIG. 11S

Protein that lacks motif A (ver. 2)



CTGTCACGCCGGGCTCTACGTCCCAGGGAGGGAGGGGCGGCCACACCCAGGCCCGCACCGCTGGGAGTCTGAGGCCTGAGTGAGTGTGTTGGCCGAGGCCTGCATGTCCGGCTGAAGGCT  
GAGTGTCGGGCTGAGGCCCTGAGCGAGTGTCCAGCCAAGGGCTGAGTGTCCAGCACACCTGCCGTCTTCACTTCCCCACAGGCTGGCGCTCGGCTCCACCCAGGGCCAGCTTTTCTCAC  
CAGGAGCCCGGCTTCCACTCCCCACATAGGAATAGTCCATCCCCAGATTGCCATTGTTCACCCCCTCGCCCTGCCCTCCTTTGCCTTCCACCCCCACCATCCAGGTGGAGACCCTGAGAA  
GGACCTGGGAGCTCTGGGAATTGGAGTGACCAAAGGTGTGCCCTGTACACAGGCGAGGACCCTGCACCTGGATGGGGTCCCTGTGGGTCAAATTGGGGGGAGGTGCTGTGGGAGTAA  
AATACTGAATATATGAGTTTTCAGTTTGA

***FIG. 11U***





**FIG. 11W**